



Summer heatwaves promote blooms of harmful cyanobacteria

Author(s): Johnk KD, Huisman J, Sharples J, Sommeijer B, Visser PM, Stroom JM
Year: 2008
Journal: Global Change Biology. 14 (3): 495-512

Abstract:

Dense surface blooms of toxic cyanobacteria in eutrophic lakes may lead to mass mortalities of fish and birds, and provide a serious health threat for cattle, pets, and humans. It has been argued that global warming may increase the incidence of harmful algal blooms. Here, we report on a lake experiment where intermittent artificial mixing failed to control blooms of the harmful cyanobacterium *Microcystis* during the summer of 2003, one of the hottest summers ever recorded in Europe. To understand this failure, we develop a coupled biological-physical model investigating how competition for light between buoyant cyanobacteria, diatoms, and green algae in eutrophic lakes is affected by the meteorological conditions of this extreme summer heatwave. The model consists of a phytoplankton competition model coupled to a one-dimensional hydrodynamic model, driven by meteorological data. The model predicts that high temperatures favour cyanobacteria directly, through increased growth rates. Moreover, high temperatures also increase the stability of the water column, thereby reducing vertical turbulent mixing, which shifts the competitive balance in favour of buoyant cyanobacteria. Through these direct and indirect temperature effects, in combination with reduced wind speed and reduced cloudiness, summer heatwaves boost the development of harmful cyanobacterial blooms. These findings warn that climate change is likely to yield an increased threat of harmful cyanobacteria in eutrophic freshwater ecosystems.

Source: <http://dx.doi.org/10.1111/j.1365-2486.2007.01510.x>

Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Food/Water Quality, Temperature

Food/Water Quality: Biotoxin/Algal Bloom

Temperature: Extreme Heat

Geographic Feature:

resource focuses on specific type of geography

Freshwater

Geographic Location:

resource focuses on specific location

Climate Change and Human Health Literature Portal

Non-United States

Non-United States: Europe

Health Impact: 

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation: 

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: 

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Resource Type: 

format or standard characteristic of resource

Research Article

Timescale: 

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: 

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content